

THAT WHICH IS CLAIMED:

1. A containment device for use in retaining debris material traveling radially outward in a rotary device, the containment device comprising:

5 an outer ring extending generally circumferentially and defining an inner surface directed radially inward; and

a plurality of energy absorption elements disposed on the inner surface of the outer ring, each absorption element extending radially inward and circumferentially such that each absorption element is configured to be plastically deformed radially outward by debris material impacting the absorption element,

10 wherein each absorption element includes a base and a cap, the base extending in a generally radial direction between a first end connected to the inner surface of the outer ring and a second distal end, the cap being connected to the base and defining an angle therebetween.

2. A containment device according to Claim 1 wherein the cap of each
15 absorption element extends circumferentially to at least partially overlap an adjacent one of the absorption elements.

3. A containment device according to Claim 1 wherein the cap of each absorption element extends between a first end and a second end, the second end of the base being connected to the cap between the first and second ends of the cap.

20 4. A containment device according to Claim 3 wherein the second end of each cap of each absorption element extends circumferentially at least to overlap the first end of the cap of an adjacent one of the absorption elements.

5. A containment device according to Claim 1 wherein the base of each absorption element defines an angle β with a tangential direction of the outer ring at
25 the intersection of the base and the outer ring, and each cap defines an angle α with the tangential direction, the angle β being between about 35 and 95 degrees and the angle α being between about 0 and 45 degrees.

6. A containment device according to Claim 1 wherein the absorption elements extend generally in an axial direction of the outer ring.

7. A containment device according to Claim 1 wherein the absorption elements are formed of at least one of the group consisting of carbon steel, stainless steel, and nickel-chromium-iron alloys.
8. A containment device according to Claim 1 wherein the cap of each
5 absorption element is thicker than the base of the respective absorption element.
9. A containment device according to Claim 1 wherein the base of each absorption element is thicker than the cap of the respective absorption element.
10. A containment device according to Claim 1 wherein the cap of each absorption element is welded to the base of the respective absorption element.
- 10 11. A containment device according to Claim 1, further comprising a rotatable element mounted within the outer ring, the rotatable element having an outer edge that defines an arcuate path of travel, wherein the distance between the absorption elements and the arcuate path of travel is greater than about 1/10 of the diameter of the rotating element.
- 15 12. A containment device according to Claim 1, further comprising a rotatable element configured to rotate within the outer ring, the rotatable element having at least one blade extending radially outward.
13. A containment device according to Claim 1 wherein the cap and base of each absorption element are flat members.
- 20 14. A containment device according to Claim 1 wherein at least one of the cap and base of each absorption element is a curved member.
15. A containment device according to Claim 1 wherein the outer ring is configured to be at least partially deformed by the debris material.

16. A turbine with a containment device for containing debris material, the turbine comprising:

a rotatable turbine rotor configured to rotate about an axis of rotation;

5 at least one turbine blade connecting to the turbine rotor and configured to rotate about the axis of rotation with the turbine rotor;

an outer ring extending circumferentially around the turbine rotor and at least one blade, the outer ring defining an inner surface directed radially inward; and

10 a plurality of energy absorption elements disposed on the inner surface of the outer ring, each absorption element extending radially inward and circumferentially such that each absorption element is configured to be plastically deformed radially outward by debris material impacting the absorption element.

17. A turbine according to Claim 16 wherein each absorption element extends circumferentially at least to at least partially overlap an adjacent one of the absorption elements.

15 18. A turbine according to Claim 16 wherein each absorption element includes a base and a cap, the base extending in a generally radial direction between a first end connected to the inner surface of the outer ring and a second distal end, the cap being connected to the base and defining an angle therebetween.

20 19. A turbine according to Claim 18 wherein the cap of each absorption element extends between a first end and a second end, the second end of the base being connected to the cap between the first and second ends of the cap.

20. A turbine according to Claim 19 wherein the second end of each cap of each absorption element extends circumferentially at least to overlap the first end of the cap of an adjacent one of the absorption elements.

25 21. A turbine according to Claim 18 wherein the base of each absorption element defines an angle β with a tangential direction of the outer ring at the intersection of the base and the outer ring, and each cap defines an angle α with the tangential direction, the angle β being between about 35 and 95 degrees and the angle α being between about 0 and 45 degrees

22. A turbine according to Claim 18 wherein the absorption elements extend generally in the axial direction of the rotor.
23. A turbine according to Claim 18 wherein the length of each base is shorter than a distance between the second end of the base and an arc defined by the path of the at least one blade.
24. A turbine according to Claim 18 wherein the outer ring and the absorption elements have a greater length in the axial direction than the axial length of the rotor and blades.
25. A turbine according to Claim 18 wherein each cap of each respective absorption element is thicker than the base of the respective absorption element.
26. A turbine according to Claim 18 wherein each base of each respective absorption element is thicker than the cap of the respective absorption element.
27. A turbine according to Claim 16 wherein each absorption element is formed of at least one flat member.
28. A turbine according to Claim 16 wherein each absorption element is formed of at least one curved member.